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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/980,496	12/04/2001	Masakatsu Urairi	Q66626	5637

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EXAMINER

YUAN, DAH WEI D

ART UNIT

PAPER NUMBER

1745

DATE MAILED: 05/19/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/980,496

Applicant(s)

URAIRI ET AL.

Examiner

Dah-Wei D. Yuan

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5 is/are rejected.
- 7) ☒ Claim(s) 6,7 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2,4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

Art Unit: 1745

**SEPARATOR FOR BATTERY**

Examiner: Yuan

S.N. 09/980,496

Art Unit: 1745

May 14, 2003

***Specification***

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1,3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Otani et al. (JP 2000-223106) in view of Amano et al. (US 5,416,149), and further in view of Nakamura et al. (EP 0805172 A2).

With respect to claim 1, Otani et al. teach a battery separator that is made of an ultrahigh molecular weight polyethylene porous sheet. See Abstract. However, Otani et al. do not teach the application of a polymer having carbodiimide groups on the porous sheet. Amano et al. teach the fabrication and use of a pulp-like material, which comprises polycarbodiimide as a coating. The material can be made into a sheet with excellent electrical insulation, heat resistance, flame resistance and mechanical properties. In particular, the material is suitable to be used as electrical insulating paper and battery separators. See Column 2 Lines 35-37; Column 2, Lines

Art Unit: 1745

55-58; Column 4, Lines 32-40. Therefore, it would have been obvious to one of ordinary skill in the art to apply a polycarbodiimide on the battery separator of Otani et al., because Amano teach polycarbodiimide has excellent electrical, thermal and mechanical properties.

Moreover, Nakamura et al. teach a process to produce a polyfunctional polycarbodiimide compound containing at least four or more molecular chains bonded independently to a backbone. Each of the molecular chains contains a carbodiimide ( $-N=C=N-$ ) group. The polycarbodiimide compound can be obtained by reacting an isocyanate compound having one or more carbodiimide group and one or more isocyanate groups (side chain component) with the polyol, polyamine and/or aminoalcohol having four or more hydroxyl (backbone component), and, if necessary, further reacting the monohydric alcohol (terminal component). The molecular weight of the resulting polycarbodiimide compound is about 1,000 to 30,000. See Abstract; Column 3, Lines 7-21; Column 5, Lines 37-40. Nakamura et al. recognize that the molecular weight of the polycarbodiimide is a function of the side chain components, backbone component, and terminal component used in the process. Therefore, it would have been within the skill of the ordinary artisan to apply a polymer having the formula  $-[R-N=C=N-]_n-$  where n is an integer of 1-10,000 on the battery separator of Otani and Amano, because Nakamura et al. teach the molecular weight of the polycarbodiimide can be modified depending on the side chain component, backbone component and terminal component used in the reaction. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

In addition, applicants cannot rely upon the foreign priority papers to overcome this rejection because a translation of said priority papers (JP 2000-103446, JP 2000-103450, JP 2000-103451) have not been made of record in accordance with 37 CFR 1.55. See MPEP §201.15.

With respect to claim 3, Otani et al. teach the battery separator is manufactured by sintering ultrahigh molecular weight polyethylene powder, and then cutting it in a sheet shape. See Abstract in Otani et al.

With respect to claim 4, the polycarbodiimide coating would inherently present in the pores of the separator substrate because the porous nature of the substrate. See Abstract in Otani et al.

With respect to claim 5, when the polycarbodiimide is applied as a coating on the separator substrate of Otani et al., at least part of the surface of the substrate would be coated with the material.

4. Claims 1,2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kung (US 5,389,471) in view of Amano et al. (US 5,416,149), and further in view of Nakamura et al. (EP 0805172 A2).

With respect to claim 1, Kung teach a battery separator formed of microporous plastic sheet coated with a resin. The sheet is made of a non-woven fabric selected from the group consisting of polyolefin, polyamides and nylon fibers. See Column 2, Lines 40-42; Claim 6. However, Otani et al. do not teach the application of a polymer having carbodiimide on the

porous sheet. Amano et al. teach the fabrication and use of a pulp-like material, which comprises polycarbodiimide as a coating. The material can be made into a sheet with excellent electrical insulation, heat resistance, flame resistance and mechanical properties. In particular, the material is suitable to be used as electrical insulating paper and battery separators. See Column 2 Lines 35-37; Column 2, Lines 55-58; Column 4, Lines 32-40. Therefore, it would have been obvious to one of ordinary skill in the art to apply a polycarbodiimide on the battery separator of Kung et al., because Amano teach polycarbodiimide has excellent electrical, thermal and mechanical properties.

Moreover, Nakamura et al. teach a process to produce a polyfunctional polycarbodiimide compound containing at least four or more molecular chains bonded independently to a backbone. Each of the molecular chains contains a carbodiimide ( $-N=C=N-$ ) group. The polycarbodiimide compound can be obtained by reacting an isocyanate compound having one or more carbodiimide group and one or more isocyanate groups (side chain component) with the polyol, polyamine and/or aminoalcohol having four or more hydroxyl (backbone component), and, if necessary, further reacting the monohydric alcohol (terminal component). The molecular weight of the resulting polycarbodiimide compound is about 1,000 to 30,000. See Abstract; Column 3, Lines 7-21; Column 5, Lines 37-40. Nakamura et al. recognize that the molecular weight of the polycarbodiimide is a function of the side chain components, backbone component, and terminal component used in the process. Therefore, it would have been within the skill of the ordinary artisan to apply a polymer having the formula  $-[R-N=C=N-]_n-$  where  $n$  is an integer of 1-10,000 on the battery separator of Kung and Amano, because Nakamura et al. teach

the molecular weight of the polycarbodiimide can be modified depending on the side chain component, backbone component and terminal component used in the reaction. *Discovery of optimum value of result effective variable in known process is ordinarily within skill of art.* In re Boesch, CCPA 1980, 617 F.2d 272, 205 USPQ215.

With respect to claim 2, Kung teaches the separator substrate is a non-woven fabric comprising polyolefin fibers. See Claim 6.

#### ***Allowable Subject Matter***

5. Claims 6,7 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claims 6,7 would be allowable because the prior art does not disclose or suggest that the separator substrate is produced by aggregating polycarbodiimide-coated polymer particles.

#### ***Conclusion***

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Nakamura et al. (EP 0805172 A2) do not teach or suggest a battery separator having a carbodiimide group. Saito et al. (EP 1,059,348 A1) do not teach or suggest a battery separator obtained by applying a polymer have carbodiimide group.

Art Unit: 1745

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dah-Wei D. Yuan whose telephone number is (703) 308-0766. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Dah-Wei D. Yuan  
May 15, 2003

A handwritten signature in black ink, appearing to read 'Dahwei Y', with a long horizontal flourish extending to the right.